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NSF Project Overview

CSCI 4243W Writing Assignment 1 - Rewrite

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As drones become cheaper and more commonplace, pressure is beginning to mount on lawmakers to propose regulation on the hobbyists’ devices. Reports of drones flying alongside passenger airlines, within restricted airspace above sensitive government or military installations, and around airport control towers are just some of the increasing issues with drones that the Federal Aviation Administration is needing to contend with. Multiple individuals have recently been imprisoned for flying quad-copters in no-fly-zones, as well as too close to police, fire rescue, or other official helicopters. The proposed project seeks to remedy that growing concern with a drone tracking and monitoring system. It will ultimately be combined with two others’ projects to include a full error detection and recovery suite.

Between four and eight cameras will be placed high along the walls of a room. Each camera will have its live feed streamed back to a central location to be used in generating a 3D model of the monitored room. The surveillance portion of the program will then begin, which will continually scan the room for small, autonomous drones. Once identified, the drones will be tracked and spatially placed in the aforementioned model. The program will use the drone’s location and movement patterns to determine if it is functioning normally and within its operating parameters, which will be provided by another team member’s project. If the program determines the drone’s movement to be inconsistent, this information will be relayed to a different component for rectification.

The project will face two main algorithmic challenges. Firstly, each individual camera in the array must be able to recognize one, or multiple, drones in real time based on a visual feed alone. Color alone could not meet this requirement, as a bystander with an incorrectly-colored shirt could trigger a false positive. The system cannot be guaranteed to have no other moving objects aside from the drones in view, so motion detection cannot be the sole identifier either. The final product will need a combination of the aforementioned routes, as well as consideration of the visual patterns on the drones themselves. The second major challenge will be generating a model of the monitored area in software, based on the camera feeds and their staggered locations and viewing angles. This model must be capable of having an associated three-dimensional coordinate system, so as to algorithmically place and analyze the drones in that space.

A later version of the project can be expanded out to implement drone tracking over GPS satellites, assuming every drone was registered and tagged with a receiver. This data would be sent to a central system, which can monitor if drones enter restricted airspace, or are in close proximity to a sensitive object. As drones become cheaper and more commonplace, they will begin to assume more important roles in society, such as mail and package delivery, fire services, live new broadcasting, and many more. Error detection and security countermeasures will need to be in place to ensure that drones remain safe while in the air and can continue to assume critical roles without the risk of catastrophic failure. Such a world-wide drone tracking system could guarantee the safety of commercial airplanes and helicopters, as well as other critical entities. The proposed project is the first step towards a global drone protective system.